NORTHROP GRUMMAN

Response to the Arkansas Request for Information Submitted to Arkansas Health Information Exchange

Response Due by: May 7, 2010 3 p.m. CDT

Email Response to:
Alison.nicholas@hit.arkansas.gov

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Mandatory Response Requirements

Respondents shall provide the following information:

1. **Name and Category of Respondent,** such as systems integrator, licensee, service provider, hardware vendor, etc.

   Northrop Grumman is a trusted Systems Integrator.

2. **Name of Vendor Representative** responsible for any future business opportunity with the State of Arkansas. Include contact information. General vendor background and corporate information is not required, but may be included in the Addenda.

   Jim Arndell, Senior Contracts Manager, Northrop Grumman Health and Human Services, 100 Sun Avenue, Suite 400, Albuquerque, NM 87109; (505) 998 8403; jim.arndell@ngc.com

3. **Summary Description of Solution**, limited to three pages.

   See response below.

4. **List of Current Installed Locations** for the recommended solution.

   See response below.

5. **Estimate of implementation timeline:** Pilot project and broader installation.

   See response below.

6. **Description of the Financial Business Models supported**.

   See response below.

7. **Suggested Service Level Agreement terms**.

   See response below.

8. **Rough Order of Magnitude Cost of Solution Components**

   See response below.

Response to the Arkansas Request for Information for Health Information Exchange (HIE)

Executive Summary

Our Related Corporate Experience

Locally, our Northrop Grumman Arkansas Team has been successfully supporting the State of Arkansas on various IT initiatives for almost 15 years. We have a talented, seasoned, long term IT staff of about 100 employees located in Little Rock presently supporting two agencies for the State of Arkansas. As you may be aware, Northrop Grumman is a trusted systems integrator, not a product vendor, and we have unique expertise and reach back capability in supporting Department of Defense (DoD), Centers for Disease Control (CDC), Veterans Administration (VA) and Veterans Health Administration Health (VHA) systems. Our core business focus however, *is* providing solutions for complex systems integration solutions such as the creation and implementation of an interoperable HIE for the Arkansas State Health Alliance for Records Exchange (SHARE). For 10 years, the Northrop Grumman Corporation (NGC) has been on the cutting edge of health information exchange technology. NGC is currently in production as the contractor for the Department of Defense (DoD) and Department of Veteran Affairs (VA) Federal Health Information Exchange/Bi-directional Health Information Exchange (FHIE/BHIE) program and the Clinical Data Repository (CDR)/Health Data Repository (HDR) (CHDR) program which exchanges data between the VA and DoD clinical systems. We are also currently involved with the Military Interoperable Digital Hospital Test bed pilot (MIDHT), a project funded by the DoD under the direction of the Conemaugh Health System. This project demonstrates how the NHIN provides a technology "gateway" and a legal framework for the secure exchange of health information between physicians, when authorized by a patient, ensuring around-the-clock access to critical health information, while helping to avoid redundant care and testing. The Conemaugh and NGC team contributed to the development of the universal adapter currently in use in the national Virtual Lifetime Electronic Record (VLER) project (VLER 1a) in San Diego.

Northrop Grumman has another HIE pilot program with KRM Associates demonstrating consumer empowerment through an integrated Personal Health Record (PHR) application. Patients can have access to and control over their personal health information being shared between

providers at the community and national level. The pilot highlights connections with open source VistA and RPMS at one designated hospital, one clinic and the NHIN Connect at the KRM Data Center in Shepherdstown West Virginia.

By leveraging these NGC efforts Arkansas will promote Health and Human Services and the Office of the National Coordinator efforts to enable the NHIN as the gateway for health information exchange. By reaching out to providers, institutions, and agencies in both the private and public sectors this effort will ignite a community-by-community outreach to adopt electronic health records and produce quality outcomes.

Corporate Viability

Northrop Grumman is a national Tier 1 information technology (IT) systems integrator that offers a wide range of services to both commercial and government clients. As a trusted systems integrator, we have worked with senior management, policy leaders and health IT specialists for more than 20 years. Northrop Grumman has successfully served the information technology (IT), informatics, mission application and support requirements of commercial, federal, state, local and international public health organizations (**Exhibit ES-1**).

Exhibit ES-1. Trusted Government Partner

Serving Major Public Health & Human Services Organizations
■ U. S. Social Security Administration (SSA)
■ U. S. Department of Health and Human Services (HHS)
■ Centers for Medicare & Medicaid Services (CMS)
■ U. S. Department of Defense (DoD)
■ States of AL, AR, CA, DE, KS, ME, MT, PA, RI, and WA
■ U. S. Department of Veterans Affairs (VA)
■ U.S. Department of Veterans Health Administration (VHA)
■ National Institutes of Health (NIH)
■ U. S. Food and Drug Administration (FDA)
■ U. S. Agency for International Development (USAID)
■ Substance Abuse and Mental Health Services Administration
■ Joint United Nations Program on HIV/AIDS

We have been a leader in health information exchange programs for over ten years, and our experience is particularly relevant to the Arkansas HIE project. Moreover, we have an in-depth understanding of both healthcare information exchange systems and health and human information systems that must support multiple external interfaces and provide the highest levels of information security and data privacy.

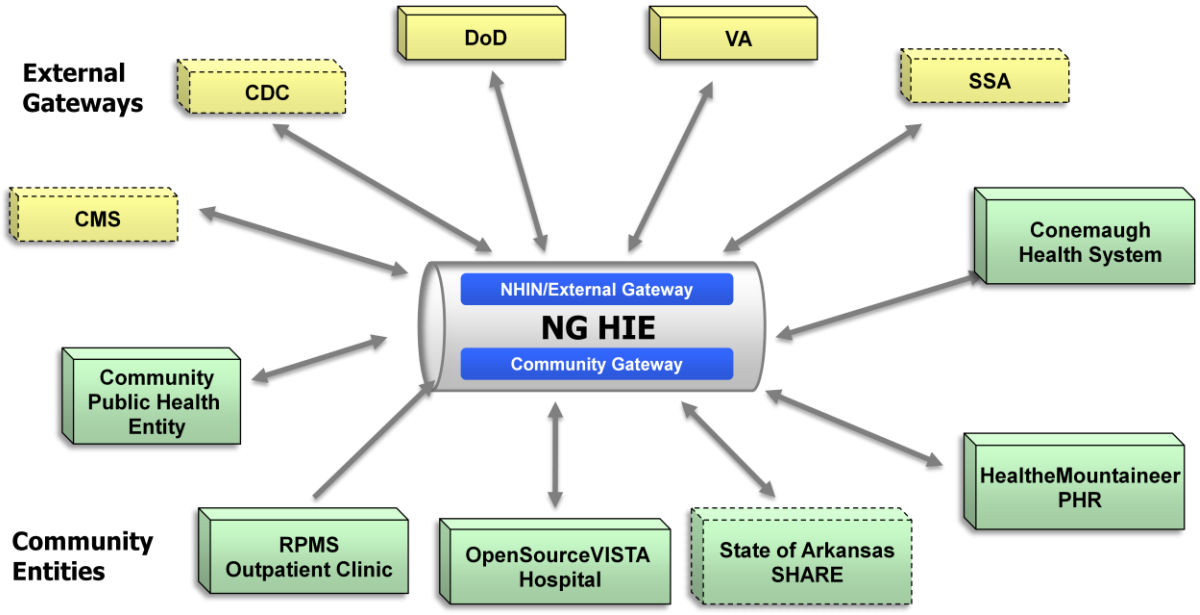
Working closely with state and local governments throughout the United States, Northrop Grumman develops systems for Health and Human Services programs ranging from child support enforcement, child welfare, Medicaid, and immunization and food stamp services.

Bringing a strong, mission-centric culture to each engagement, Northrop Grumman has forged long-term client relationships with the majority of customers, in some cases over 15 years.

We are the largest contractor to the CDC and our experts are at the forefront of public health informatics. Northrop Grumman helps customers improve the health and welfare of the U.S. and its allies by enabling the timely and efficient delivery of the ten essential Public Health Services defined by the Centers for Disease Control and Prevention.

Northrop Grumman is one of the largest contractors to the Centers for Medicare and Medicaid Services (CMS), providing systems and support that deliver health systems management processes securely and cost-effectively. In addition, a recent Medicaid Eligibility application development and implementation that Northrop Grumman has completed for the State of Montana is called CHIMES."CHIMES' is a web-based health care eligibility system designed to streamline eligibility determination and case processing for Medicaid and other state medical assistance programs. CHIMES implements cascading eligibility driven by a business rules engine to ensure consistent application of eligibility policy. This work helps drive more efficient Medicare and Medicaid operations and improved service to beneficiaries. Recently, Northrop Grumman was awarded the contract for the National Level Repository (NLR). The contract will produce the infrastructure and software to support the HITECH act which provides financial incentives to healthcare providers for the adoption of electronic health records.

Exhibit ES-2. Federal and State Organizations with which Northrop Grumman has and/or desires to connect to our Exchange



Summary Description of Solution

We are proposing a solution based upon the NHIN-Connect, open source software with customized Northrop Grumman extensions. We can leverage adapters already built to connect to EMR systems and allow the state to build more or customize more adapters to meet their needs. This effort can be performed utilizing the classic development or total cost of ownership model.

Northrop Grumman's technical solution will utilize the key technologies (Exhibit 2) required for a successful SHARE. Our HIE Core Infrastructure solution is based on a Service-Oriented Architecture (SOA) that was developed to leverage standard health information protocols. Our HIE can accommodate both HL7v3 and HITSP Cross-Enterprise Document Sharing (XDS) protocols and is compliant with the current Nationwide Health Information Network (NHIN) standards. Our HIE solution can interface with both CCHIT-certified and non-CCHIT certified EMR systems. By implementing a SOA that is based on standard health information protocols,

our technical solution provides Arkansas with an HIE system that has a growth path for additional data exchange capabilities in the future.

Exhibit ES-3: Our Team Will Utilize Technology Expertise from Across our Corporation

Key Technology Capabilities	
• Security & Privacy Compliance & Assessments • Identity Management • Service Oriented Architectures (SOA) • Workflow engines & Document Management • Clinical Natural Language Processing (NLP)	• Web-based applications • Enterprise Architectures • Data Warehousing • Critical Infrastructure Management • Comprehensive Training

Northrop Grumman would propose the following approach for providing an HIE for the State of Arkansas. This approach uses the Nationwide Health Information Network (NHIN) NHIN-Connect software as a basis for the solution with custom additions by Northrop Grumman and our partners. NHIN Connect software at revision 2.4.1 is now robust enough to support real world health information exchange. It is open source software. It adheres to open standards (most of which are from "Integrating the Health Care Enterprise" (iHE – www.ihe.net)) as refined by use cases proposed by the American Health Information Community (AHIC) and refined by the Health Information Technology Standards Panel (HITSP). AHIC and HITSP were both established by the U.S. Department of Health and Human Services. AHIC was later spun off into an independent organization in 2009.

Technical Response

Critical Elements of the Proposed Solution

Exhibit 1: Our Proposed Approach and Solution

	Major Objectives	Our Approach
✓	Establishment of the NHIN Gateway functionality. Utilize hybrid technology; maintain confidential healthcare data at participating facilities and providers, with an option for the consumer/patient to ask for his/her information to be held in a health record bank account they control. Use a secure and trusted conduit rather than a centralized repository.	The nucleus of our technical approach is the Northrop Grumman Health Information Exchange (HIE) Framework. Our HIE Framework is a Service-Oriented Architecture developed to provide secure information exchange using SSL encryption. In addition, we will leverage "open source" applications when available and leverage our NHIN gateway and adapters.

✓	Allow consumers to have access to and control over their health information through health record bank and personal health record applications	Configure adapters for SHARE and provider EMRs to our HIE Framework to provide consumers with access and control over their health information. Establish HIE Framework operations on redundant, clustered servers in Northrop Grumman's Arkansas Data Center to provide the health record bank.
✓	Allow individuals to have freedom to participate or not to participate in the HIE.	Privacy of an individual's health information is a cornerstone of the HIE solution. Our implementation will allow citizens of Arkansas to review, validate, and release their data only as they choose and as specifically allowed by the Health Insurance Portability and Accountability Act (HIPAA).
✓	Build an HIE that is consistent with emerging national technology standards.	We have been a leader in health information exchange programs for the past ten years. We have a senior executive that has been a member of the Technical Advisory Panel (TAP) for the Health Information Security and Privacy Collaboration (HISPC). We are a corporate sponsor of the Healthcare Information Management Systems Society (HIMSS) and contribute to their legislative activities. Our solution will be implemented in a manner consistent with national technology standards.
✓	Act now but build incrementally.	We will utilize a systems approach based on CMMI Level 5 processes and procedures that will address the implementation of requirements in a priority order that can be incrementally provided successfully over the life of the project.
✓	Recognize that EHR adoption among physicians is crucial to HIE success.	Our solution will improve access to healthcare services and allow for flexibility in response to changing state or federal requirements while reducing the duplication of healthcare services.
✓	Develop a financially sustainable HIE.	The open source approach dramatically reduces one of the primary barriers to HIE entry which is acquisition cost. We will partner with SHARE in establishing a financial model to achieve sustainability

✓	Ensure focus on the medically underserved.	Northrop Grumman will work with the SHARE project to offer the support and services to the public health clinics and other organizations in a cost effective manner that will provide them with the capabilities to ensure that the best health care available can be provided to the medically underserved.

Interoperability

Interoperability is the key to the success of Health Information Exchange. For many years interoperable health care technology has been hard to find. It seems that as healthcare software developed there was little thought given to the exchange of data, nor was there much given to finding a common terminology and code set for medical terms so that the data itself could be shared unambiguously.

Efforts have been made toward interoperable healthcare data and software, but little in the way of exchange of the data has been widely implemented. Only in the last few years have there been efforts that have brought several participants to implement the exchange of data via standards. While HL7 version 2.x has been widely implemented, the use of "custom segments" has by itself prevented complete interoperability through using that standard. The emergence of extended meta-language "XML" as a standard for data exchange of all kinds has spurred the development of a message passing architecture based on HL7 version 3. However, many saw that new specification as "too complex" for implementation and thus ignored it.

Integrating the Healthcare Enterprise (iHE) has been the most successful organization so far in driving standards for Health Information Exchange (HIE). Their suite of standards for HIE has been implemented by several vendors. When the U.S. Department of Health and Human Services established the Health Information Technology Standards Panel (HITSP) in 2005, they were designated as the group that would set standards for Health Information Exchange within the federal government. Since the federal government deals with a large and growing amount of healthcare in America, this left HITSP with significant clout in setting standards for Health Information Exchange. HITSP chose to follow the iHE standards where such standards matched the needs of HITSP. Unfortunately iHE has been centered on a document exchange model for health information exchange, while HL7 version 3 is centered on a message passing model. The document model is based on the traditional approach of doctors taking paper records and faxing them to one another, yielding a "fax on demand" approach to health information exchange. The Nationwide Health Information Network (NHIN) has been based on HITSP standards, most of which are based on iHE specifications.

Technical Architecture and Approach

Our approach is to focus on the evolving NHIN standards and the open source implementation (known as NHIN-Connect) while at the same time providing customized enhancements as selected by the state of Arkansas. While NHIN Connect in its present form does not fill all of the functions envisioned by the state of Arkansas, it can be extended to reach those capabilities. For example there is nothing in NHIN Connect that provides for the electronic sharing of insurance information (eligibility, coverage), nor is there any capability for performing electronic invoicing and payments.

Design Principles and Requirements

The design principles of our proposed solution:

1) **Vendor Neutral** – the iHE/HITSP/NHIN protocols are not vendor specific and are in the public domain.
2) **Network -** The network to be used is the ubiquitous internet with appropriate security technologies applied
3) **Hybrid Architecture** – The NHIN architecture is a non-centralized architecture. Each community maintains its' own patient index and health care data. At present an NHIN gateway can support only 1 local community, however, the code could be modified so that a single gateway could support multiple local communities.
4) **Exchange of Information** – As presently implemented the NHIN exchange can share any kind of document (the protocol does not care what the content is). That being said, most of the documents being shared by NHIN today are various flavors of Clinical Document Architecture (version 2.0), which include the Continuity of Care (CCD) document.
5) **Longitudinal Patient Record** – A "Longitudinal Health Record" is one that covers the entire life of a patient. While not necessarily convenient to search, a set of documents could capture the longitudinal health record for a patient.
6) **Adhere to Interoperability Standards** – The iHE and HITSP standards on which NHIN is built are the most widely adopted standards for HIE in the United States.
7) **Interoperate with existing community and private health information exchanges.** While we know of some exchanges based on NHIN protocols are up and running, we don't know what HIEs already exist in the state of Arkansas, nor what their capabilities may be.
8) **Scalable and expandable** – NHIN is based on a set of web services. Each web service can dynamically be moved from one computer to another, thus easily facilitating scaling as growth proceeds. The NHIN components can live in the cloud.

9) **Use Standard security protocols** – NHIN uses standard security protocols
    a. SSL /TLS for encryption of data while in transit on the network
    b. SAML for encoding of who is making a request for information
10) **Standard data storage and management protocols** – NHIN does not specify what methods are used for data storage and management. End users may select the data storage and data management devices which they favor.
11) **Business Continuity and Disaster Recovery** – Just as NHIN does not specify what data storage technologies to use, it does not specify what approach to take to provide for disaster recovery. The disaster recovery approach will be more heavily dictated by what databases are used with NHIN-Connect than any other factor.
12) **Arkansas Accessibility (1999)** – Northrop Grumman is very experienced in meeting the accessibility requirements for impaired access to computer applications in compliance with Section 507 specifications of the federal government.

Architectural Overview

The NHIN architecture (discussed in detail under Nationwide Information Network (NHIN) see below) has a service oriented architecture (SOA) based on web services. There are numerous web services that work together to provide for:

- Identification of patients
- Sharing of documents
- Unsolicited sending of documents
- Subscriptions to events of interest
- Notifications that an event of interest has occurred
- Taking actions based on the receipt of a specific notifications
- Searching the audit logs for transactions of interest completed by the exchange

If required these services can run on separate computers to manage an evolving growth in activity on the exchange. The exchange is amenable to running in the cloud computing model.

Core Requirements

1) **MPI** – A robust MPI is required to best solve the patient matching challenge. We would recommend our partnering with a commercial MPI vendor for MPI implementation.
2) **Data Dictionary and Medical Terminology Standardization** – This problem is often discussed but rarely solved. Over time there have been several systems developed for encoding medical information LOINC, SnoMED, ICD etc. Some of these systems overlap

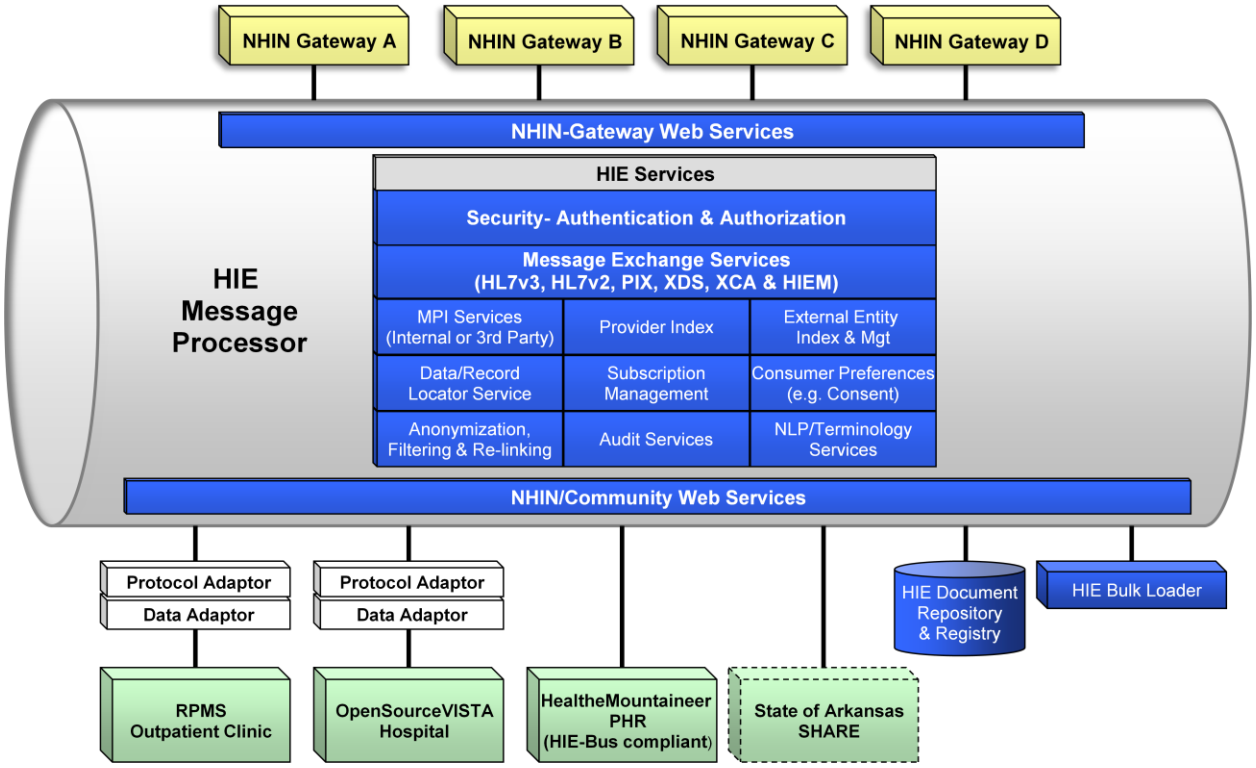
each other. It has always been desirable to be able to unambiguously translate information for one system to another. To do this successfully and in a complete way requires:

a. Appropriate software to perform medical data translation between code sets.
b. Medical informaticists that can correctly map medical codes from one system to another.

Northrop Grumman implemented a technology for the Department of Defense known as "Terminology Service Bureau" (TSB). This was a successful approach which enabled experience building data translation tables to work with existing technology. Northrop Grumman has extensive data mapping experience within several large health information exchanges. Northrop Grumman has been involved in prototyping technologies by which natural language text can be parsed into computable medical data. Such prototype efforts have shown that such translations can be successful. This is important since much medical data today exists only in textual and not computable formats.

3) **Provider Index** – This is another area that needs more attention than it has been given to date. The government is requiring all providers to obtain a "National Provider Identifier" [somehow it is OK for providers to be assigned nationally unique numbers, but not patients]. Should the government open up this database, we could have a robust provider index. Until that time providers will have to be grown from scratch or other large databases that may include such data. Fortunately a provider index is very similar to a patient index and the schemas from a patient index can easily be adapted to a provider index.
4) **Standards based** – The NHIN protocols are all standards based.
5) **Security** – The NHIN Connect implementation uses standard security technologies. See #9 under "Design Principles and Requirements".
6) **Flexible** - Some NHIN protocols have evolved already and will continue to do so. Today clinical data exchange is based on document sharing; in the future it may be based on a message passing architecture. In any case such changes are adaptable to the web service based approach used by NHIN.

Exhibit 2: Northrop Grumman HIE High-Level Architecture



Phased Implementation Approach

We fully concur with the concept of performing phased implementations of a state-wide HIE for Arkansas. The technology to support clinical health information exchange is likewise being made available incrementally. Additionally, growth in the number of participants in the exchange needs to be phased so as to not overwhelm the available resources (computer power and manpower for technical support) and changes in business processes.

Northrop Grumman would propose the following approach for providing a Health Information Exchange for the state of Arkansas. This phased implementation approach uses the NHIN-Connect (open source) software as a basis for the solution with custom add-ons by Northrop Grumman and our partners.

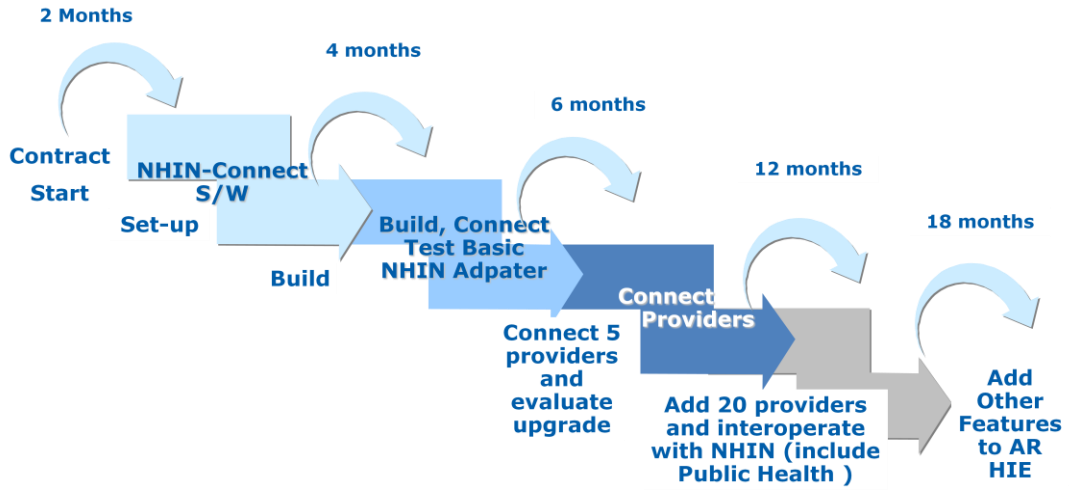
1) Provide within 2 months of the contract start date an NHIN Gateway using the most current version of NHIN Connect software that has been available for 30 days prior to contact start.

2) Within 4 months of the contract start date provide a basic NHIN adapter to the Arkansas State Department of Health so that they have a presence on the state network.
3) Within 6 months of the contact start date provide connectivity with up to five providers in the state of Arkansas who can achieve readiness with the NHIN Connect or NHIN Direct protocols.
4) Evaluate at 6 months after contract start date the value and feasibility of upgrading the network to the then current version of NHIN Connect Software and evaluate the value and feasibility of connecting to some subset of other NHIN gateways that are in operation and who are willing to join with Arkansas.
5) At 12 months after contract start date add up to 20 other providers in the state of Arkansas which are ready to interoperate using NHIN or NHIN Direct protocols. At this point the state health department would also begin receiving selected date from networked providers in the state.
6) At 18 months provide Arkansas with other desired HIE capabilities which the state selects and which are not part of the NHIN Connect development roadmap. These might include:
    a. Network connectivity between providers and payers for exchange of benefits eligibility, status, as well as billing and payment data. An inherent advantage of doing so, beyond the secure exchange of standard revenue life-cycle data, is the ability of the HIE to impact improvement in the current healthcare revenue lifecycle; including transaction fees charged for such transactions and other services within the HIE can help sustain the Health Information Exchange.
    b. A system for translating between selected medical data terminologies into selected canonical medical terminology set.
    c. A personal health record system that allows patients the ability to access their own health information records. Through open-source technologies, electronic health information can be captured and displayed at a fraction of the cost of other Personal Health Record solutions. Through integrating a Personal Health Record with a Health Information Exchange, the potential for patient involvement in care increases dramatically as well. A patient has the potential to manage access to records across all providers connected to the exchange. A PHR system is essential to allow patients to take control of who can have access to their medical records. Furthermore, it will provide them with easy access to their own immunization data as needed.
    d. Public health immunizations and exchange of shot records.

e. Chronic Obstructive Pulmonary Disease (COPD); weather mapping alerts: NGC has extensive research in regional climate modeling for climate change impacts and adaptation. Decision tools and alerts can be leveraged within the HIE to help reduce emergency room visits for COPD patients. Chronic disease management and clinic decision tools.

Implementation Timeline

Exhibit 3. Our Proposed Implementation Solution Timeline



Installed Locations

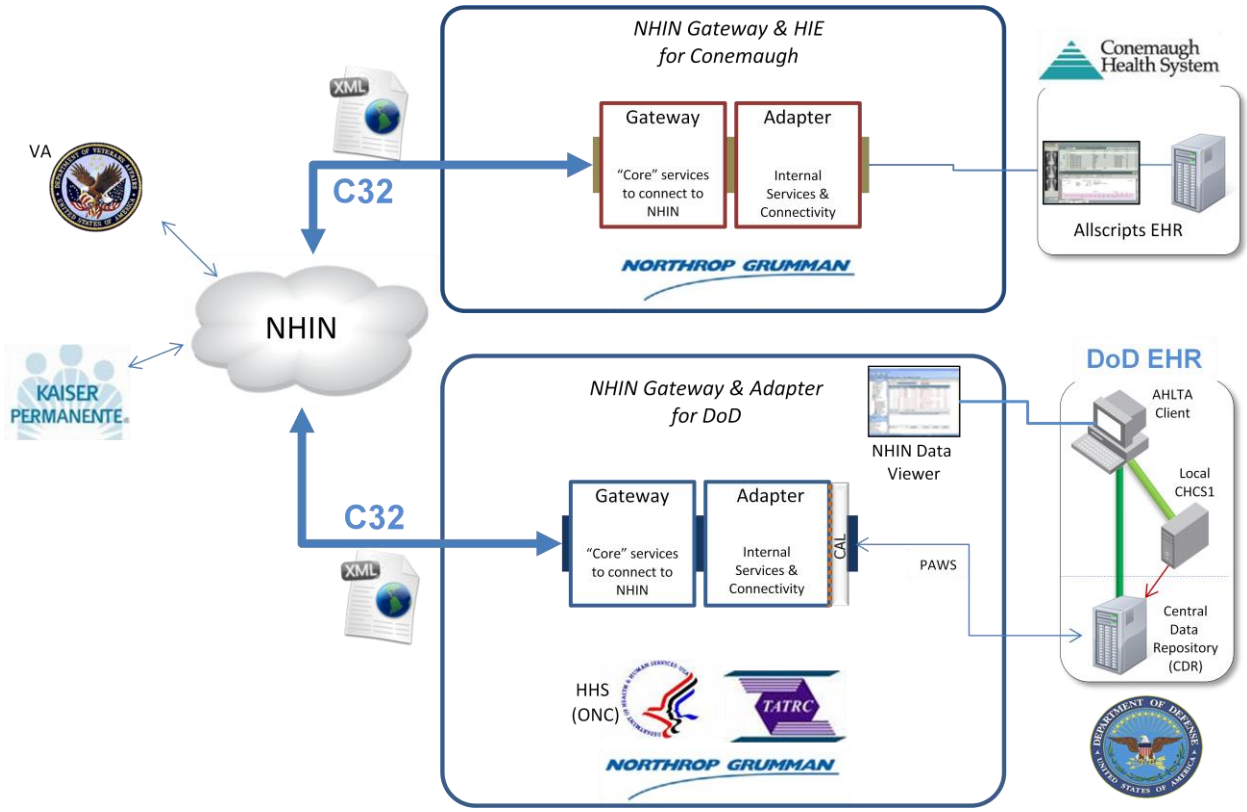
As of April 1, 2010 the following sites are running Health Information Exchanges using some version of the NHIN Connect software:

1) Social Security Administration (SSA) and Med Virginia for the collection of data to support disability claims. Over the next year SSA plans to add up to eighteen more Health Exchanges to this project
2) The Department of Defense (DoD), the Veterans Health Administration (VHA) and Kaiser Permanente have a pilot program operational (VLER-1(a)) in San Diego, California. [Note: Northrop Grumman assisted in development of the DoD universal adapter which allowed the DoD to generate clinical documents on the fly from data stored in their

large clinical data repository (CDR). We have specific expertise in dynamic document generation, the basic code for this is a part of NHIN Connect version 2.4]

3) The Centers for Disease Control (CDC) is also connected to one or more unspecified groups. They plan to expand their connections significantly over the remainder of 2010.

Exhibit 4: Northrop Grumman DoD, VHA Pilot Implementations



The Stake Holders

Within the healthcare system there are well defined sets of participants. Among these are

- Providers (also known as clinicians)– those people who provide healthcare services
- Patients – those who receive healthcare
- Payers – insurance and governmental agencies that pay for healthcare
- Public Health – Government agencies that work to monitor and improve the general health of the population.

These parties each have their own objectives and responsibilities within our modern healthcare system.

With respect to the use of technology to assist in driving efficiencies and quality within the system, the payers are at the forefront, followed by patients (who are using the web to find

information), and lastly providers and public health entities. While many patients are computer savvy, most of them cannot access detailed information about their own healthcare, since much of that data is in paper form and thus not accessible by computer. The payers actually have the data of interest (not just the cost values, but also clinical information), but they generally don't make any of it available to anyone outside their organizations. Some have said that most of the country's health care information is computerized and exists on the computers owned by the healthcare payers, yet few can actually make any use of it.

Healthcare Information Exchange can optimize the sharing of healthcare data among all four stakeholders. Such sharing should help all parties in performing their jobs better and help drive down costs for duplicate services. Empowered patients can take more responsibility for their own healthcare and better track their own progress.

Today, there are some groups where the exchange of payment data is done via a network. The state of Utah for example started its health exchange by first focusing on streamlining the payment process. Perhaps they realized that by focusing on "where the money is" is also the place where they can most likely charge fees for the services rendered. The focus on the past few years has centered on the sharing of the clinical data. The NHIN has been almost solely focused on clinical data sharing and technologies related to keeping that data secure and available only to authorized parties.

The Indiana Health Exchange which is the longest running exchange in the country has shown that the timely receipt of data by public health agencies has enabled the ability to stop health problems before they exploded in size. For example, when they noticed that hospital admissions for gastrointestinal problems were running above normal in the Indianapolis area, they suspected a food borne problem. So they sent people out to look for it. Soon they discovered the source of the problem and stopped it. On another occasion they determined that there were seeing the start of a disease outbreak and were able to stop it. In both cases they figured that they saved the local economy over $10,000,000.00. Thus the return on investment in HIE through Public Health should not be underestimated.

Federal Government Agencies and HIE

The federal government decided to develop one technology for health information exchange. This concept launched the NHIN Connect project. [See Nationwide Health Information Network for details].

The first agency to go into live trials using the Connect software was the Social Security Administration. They started a pilot with two communities focusing on the idea of being able to collect medical record for disability determination using Connect. To deal with the authorization to receive a person's medical records, a custom modification was made to NHIN Connect to allow for a special authorization to be encapsulated in the SSA request for medical information. The major difficulty remaining was that the recipients of this request wanted to have a human involved in the review of the authorization material before medical information was returned. Connect version 2.4.1 (the most recent version) contains new code to allow the response to such requests to be delayed in such a way that a human can first evaluate the authorization before a response is sent.

The Veterans Health Administration (VHA) has developed an adapter that sits between the NHIN-Gateway and their data store for VistA. The Department of Defense (like many other health care providers) has medical data which is not in the "document format" required by Connect for exchange via NHIN. In order to circumvent this problem the DoD in association with the Northrop Grumman Corporation, developed a technology that facilitates "dynamic document generation" so that the DoD healthcare data can be formatted into a document suitable for exchange through NHIN. This effort known as VLER went into pilot testing with the VA and Kaiser Permanente in San Diego California in March 2010. This dynamic document generation facility was created in such a way that others who have medical data which is not in document form can also adapt the technology to generate documents on demand when requests for medical data are received. This feature is available in NHIN Connect version 2.4.

The Centers for Medicare and Medicaid (CMS) have launched the development of a pilot to connect 12 groups of providers with CMS using NHIN Connect. The project known as Continuity Assessment Record and Evaluation – Health Information Exchange Pilot (C-HIEP), which has the goal of providing electronic health information to CMS using NHIN, which will begin to enable CMS to evaluate the quality of care being received by CMS patients. This effort is presently in development.

The efforts referred to above are the most advanced attempts to date in employing the Connect technology for Health Information Exchange.

Health Care Data Domains

The state of Arkansas has identified several data domains which they would like to target for exchange. These domains are discussed below:

1) Patient demographic information:

Every Health Information Exchange must include demographic information on patients. This is required so that a patient can be correctly matched with their personal health information. At a minimum, name, gender, and birth date are required elements when looking for data for a given individual.

2) Patient vital information such as height, weight, body mass index (BMI), problem list/health issues, list of care providers:

Problem lists area a common component in today's health information exchange. Such lists are well adapted to the document centric exchange methodology. The other items listed can be exchanged, but exchange of such items is not commonplace at this time.

3) Medication information to include prescriptions, refill requests, fill status, prescription history, and current medications:

Medication and medication history are common components of data exchanged today. Less common components of today's exchanges are refill requests and fill status. Many physicians perform on-line prescription ordering using customized software for that purpose. Meanwhile, other doctors simply generate paper prescriptions from their EMR systems.

Data on specific costs to each patient depending on their payer's formulary lists can help doctors reduce costs in the system by enabling them to select suitable yet least costly medications tailored to each patient.

4) Diagnostic testing information, such as radiology clinical laboratory orders and results:

Some doctors and laboratories are operating "on-line", but most often these interactions are done in a point to point fashion. Both messaging and document centric methods of health information exchange can provide information on laboratory requests and results.
Public health can gain insight into what's occurring in the population by getting anonym zed reports on laboratory orders and laboratory results. When available in real-time this information can provide important insights into "what's happening now".

5) Other structured clinical summary information:

Another data type that is commonly involved in Health Information Exchange today is "allergies". This is because it is important for doctors to consider allergies when ordering medications for patients. Thus allergies have become a common component of the data routinely exchanged today.

6) Public health information, such as immunizations:

While immunization data is useful, it does not have the time criticality of other data used by public health for understanding what is currently happening within the population. More critical components of public health data include:

- Hospital admission and discharge data, with current utilization rates.
- A subset of "problems" of current interest to public health. Problems of interest can change from time to time. This can be achieved by filtering the data flowing though the exchange to items of current interest to public health.
- A subset of laboratory orders and results. Such data can likewise be filtered to a list of items of current interest to public health.

The data above can provide public health insights into what is currently happening within their populations.

7) Insurance type, identification numbers, payer name, and payer contact information:

The electronic exchange of payer information can assist in reducing costs and tailoring care to the patient based on their medical coverage.

Nationwide Health Information Network (NHIN)

Background

The Nationwide Health Information Network (NHIN) has been under development since 2005. In January of 2007 four companies demonstrated prototypes. These companies included Northrop Grumman, International Business Machines, Computer Sciences Corporation, and Accenture. Northrop took the most advanced approach utilizing HL7 version 3 as its conical data model. With our partners the Cleveland Clinic and Physicians Medical Group (Santa Cruz, California) we demonstrated connectivity from one EMR system to the other. We also demonstrated how data could be filtered, anonym zed and sent to the Centers for Disease Control (CDC). The driver of the use cases implemented in these demonstrations was the American Health Information Community (AHIC). Once their use cases were decided, HITSP

then determined the technical standards that were needed to accomplish the requirements of the selected use cases. For the prototype implementation there were three use cases (a) exchange of lab data, (b) patient access to health data, and (c) bio-surveillance.

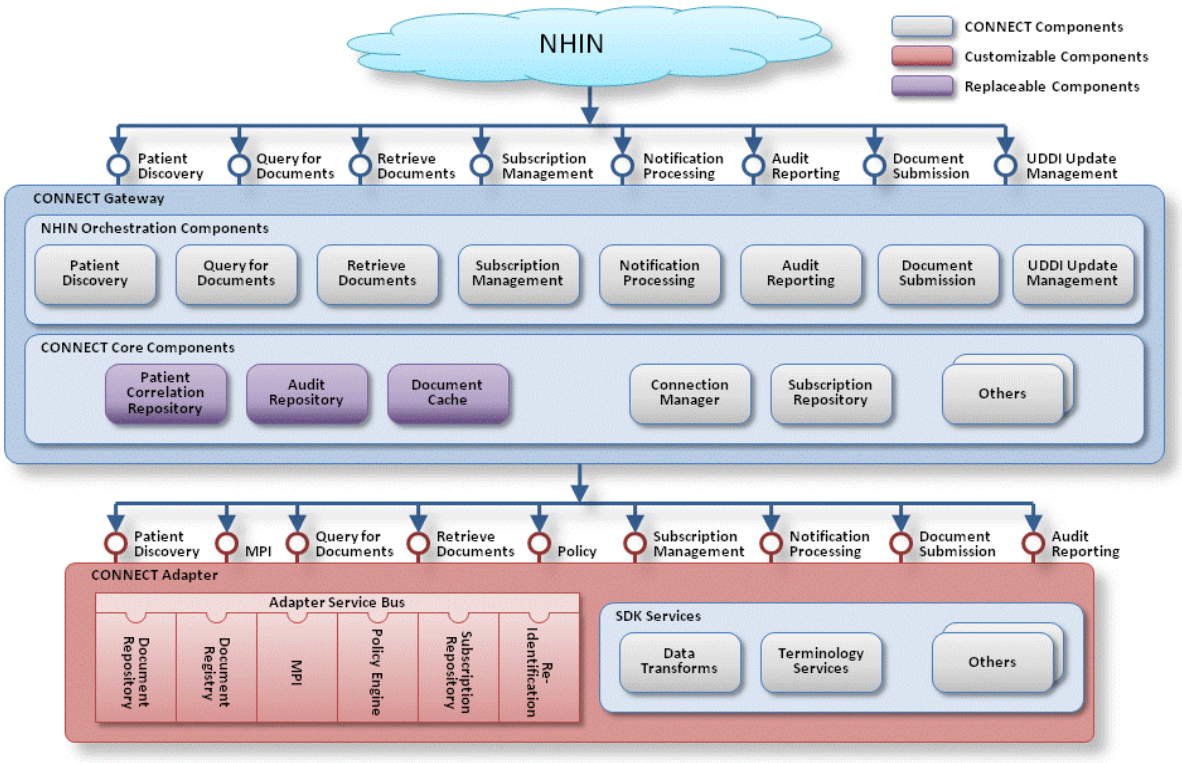
Phase 2 for NHIN was named "Trial Implementations". A dozen healthcare providers were selected to implement three different use cases from a group of eight use cases. At the same time HHS decided to issue the NHIN-Connect contract for development of "open source" software following NHIN standards that could be used by all federal agencies that deal with healthcare. The current version of the NHIN-Connect software is 2.4.1.

The "Trial Implementations" ended in 2008 with two demonstration events.

Architecture

Exhibit 5: NHIN Architecture (Inbound Requests)

The present NHIN architecture (for inbound requests) follows the diagram below:



The light blue box represents the NHIN-Gateway; while the pink box represents the NHIN-Adapter. The purpose of the Gateway is to interact with other gateways on the NHIN. The purpose of the adapter is to interface with the local community's medical data repository and Mater Patient Index.

Looking across the top of the blue rectangle (the gateway) we see the requests that are currently supported. These include:

- Patient Discovery – When new patients are added to any gateway, they are announced to the other gateways on the network so that they can be located from any gateway.
- Query for Documents – When information on a patient is requested, a "Query for Documents" request is sent to every gateway that is known to hold information for that patient. The receiving gateway sends back a list of document numbers that exist for the specified patient.
- Retrieve Documents – The requesting gateway then requests the documents of interest using the document ids returned by the "Query for Documents".
- Policy – This is the interface to the policy decision engine which decides who has access to what documents depending on established patient privacy settings.
- Subscription Management – This allows for one gateway to request that another gateway provide notification when a document is modified. For example, one gateway may want to stay up-to-date with the consumer preference profile for a given patient or patients. It would then request that other gateways that hold data for the patient(s) notify it if there are any changes to the patient(s) consumer preferences profile.
- Notification Processing – Processes the work done when a notification is received from another gateway.
- Audit Reporting – Responds to requests to view data contained within the system audit log.
- Document Submission – Allows for one gateway to "push" data to another gateway without there ever having been a request for the data (new in version 2.4).
- UDDI Update Management – the software that maintains an up-to-date inventory of services provided by other gateways and the Universal Resource Locator (URL) by which the service can be reached.

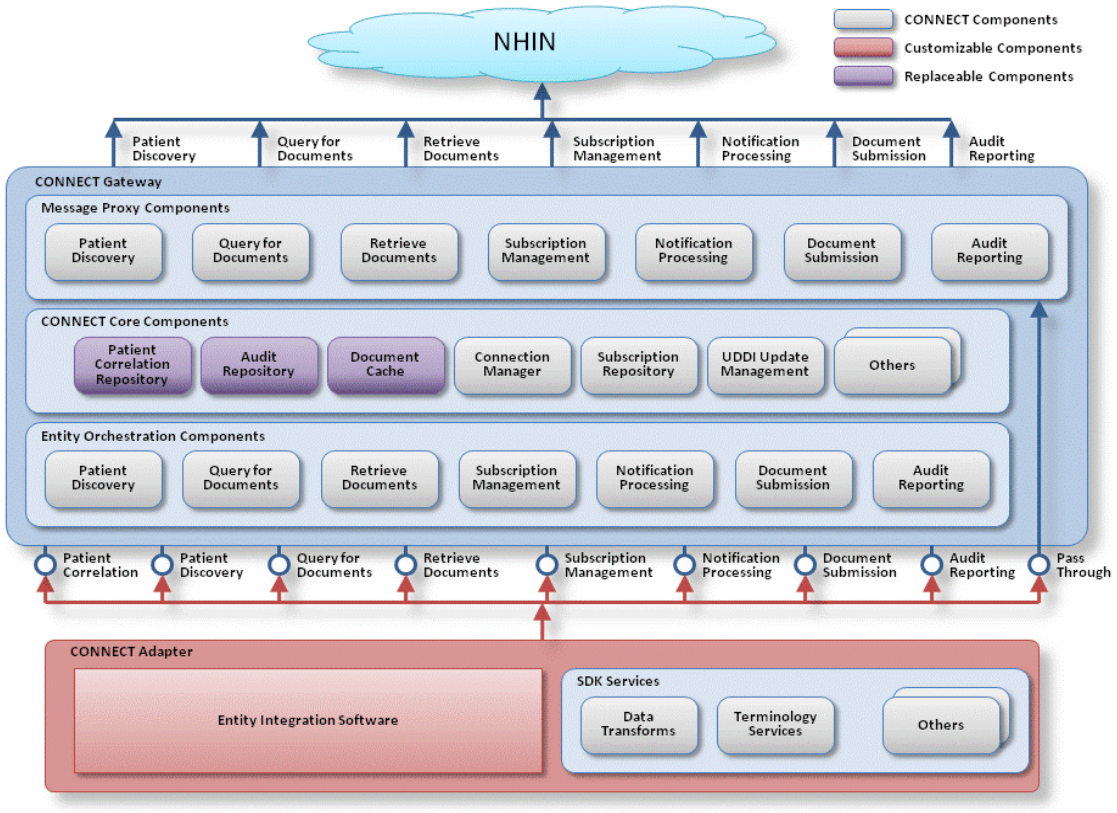
The components in the "Adapter" (pink rectangle) are generally the ones that a given EMR or medical data repository will have to develop in order to connect to the NHIN. Among these components are:

- Patient Discovery – interfaces with the" Master Patient Index" which holds information about all local patients.
- MPI – The adapter interfaces with the software that maintains the "Master Patient Index" for the local community.

- Query for Documents – interfaces to the local document store or if the EMR or data repository does not store medical data as documents, then this request may be able to generate a document on-the-fly from the local data
- Retrieve Documents – The adapter code returns the documents identified in the request using the document identifier(s).
- Subscription Management – The adapter stores the subscriptions it receives in such a way that it can send notifications when the subscribed events occur.
- Notification Processing – When a notification that an event of interest is received, the notification process takes action based on the event.
- Audit Reporting – Responds to requests regarding auditable events. This function does not tend to vary among implementations. Often the auditing function can be handled completely at the gateway.
- Document Submission – Upon receipt of unsolicited documents they are stored, so long as the patient to which they belong can be identified.

Exhibit 6: NHIN Architecture (Outbound Requests)

The architecture for outbound requests looks like this:



The outbound process is similar to the inbound processes.

- Patient Correlation – triggers
  - when a new patient is added locally
  - patient authorizes disclosure of local information over the NHIN
  - one community joins with another community to share information
  - there is a change in a patient's demographics
  - a query is directed at a specific target community (based on data from the patient)

In this transaction, the patient's demographic characteristics are sent to other gateways to determine if the new patient in known in that location in a patient discovery transaction:

- MPI – The adapter interfaces with the software that maintains the "Master Patient Index" for the local community.
- Query for Documents – Request document from a specific gateway for a specific patient. This transaction uses the patient identifier by which the patient is know at the remote gateway.
- Retrieve Documents – A request for documents by document id.
- Subscription Management – A request for subscription to events at a remote community.
- Notification Processing – Notification to a remote community that a subscribed event has occurred.
- Audit Reporting – a log that a request was made to a remote gateway and by whom the request was made.
- Document Submission – Unsolicited transmission of a document to a remote gateway.

Capabilities as of version 2.4.1

As can be seen by the above, the present NHIN system has the capability to:

1) Correlate patients with other gateways (sharing the patient identifier by which the same patient is know at each gateway)
2) Request medical documents held by another gateway
3) Retrieve medical documents for a patient
4) Subscription to events at a remote gateway (e.g. the patient changes their data sharing profile)
5) Notification of events – When changes are detected to items for which subscriptions have been registered, the system sends the notification of change to the subscriber(s).
6) Transmission of unsolicited documents for a patient
7) Displaying audit records of interest

It should be noted that the “document(s)” transferred in “retrieve documents” can be any type of document, however, the most common types of documents currently being transferred are “Continuity of Care Documents” and other documents based on the Clinical Document Architecture (CDA) version 2.

Impact of the HITECH act and Meaningful Use (NHIN Direct)

The key driver for health information exchange for 2010, 2011 and perhaps 2012 is the provisions in 2014 disincentive payments begin. The rule is likely to continue changing. Therefore, flexibility of a trusted partner (e.g. an "SI" contractor) is suggested and contained in the Health Information Technology for Economic and Clinical Health Act (HITECH) portion of the American Recovery and Reinvestment Act (ARRA) (2009). The act provides incentives for medical providers to adopt certified Health Information Technology and use it in a meaningful way. When the Centers for Medicare and Medicaid (CMS) proposed rules earlier this year for what constitutes “meaningful use” (final rules are still pending) it was discovered that the NHIN Connect software did not provide for all aspects of meaningful use. This motivated the department of Health and Human Services (HHS) to see what could be done quickly to add technology to the NHIN base to accomplish the tasks listed as required for meaningful use. Among these tasks are:

- Exchange of data between doctors and laboratories
- Issuing of electronic prescriptions
- Submission of “health quality data”

In response HHS started a new program known as “NHIN Direct” (www.nhindirect.org). This program seeks to develop point to point technologies to support these meaningful use items that are not yet supported by the NHIN Connect code. This program is hoping to come up with some point-to-point solutions by fall 2010, operating under an “all volunteer model”. The unknowns with NHIN Direct are:

- Will they succeed in producing usable code?
- How will their technologies fit back into the NHIN-Connect project?

The HITECH National Level Repository

Northrop Grumman was awarded the contract for the National Level Repository (NLR) in April 2010. Under this contract Northrop will produce the infrastructure and software required by the Centers for Medicare and Medicaid Services (CMS) to provide:

- Registration for healthcare providers seeking incentive payments under HITECH
- Collection of provider's attestation as to their "meaningful use" of health information technology
- Processing of incentive payments

As the contractor for the NLR, Northrop Grumman will understand all of the details required for a given healthcare provider to qualify for and receive incentive payments under HITECH. This insight will further ensure that Arkansas' health information exchange needs are met.

Obstacles to a Successful Health Information Exchange

The basic infrastructure based on open specifications for a national health information network has been implemented by the NHIN Connect project. While not yet broadly encompassing all the features that are desirable for such a network, the NHIN Connect framework is now a solid base on which to grown health information exchange.

While the infrastructure for a health information exchange is in place, there are other obstacles to the emergence of exchanges with numerous participants. Key among these are:

- Many medical providers have not committed to the use of computer based electronic medical records (EMR).
- Providers with EMR systems, even those that are compliant with recent specifications from the Certification Commission for Health Information Technology (CCHIT) may not be fully ready to exchange information via the current NHIN protocols. Some commercial EMR systems will still be found lacking appropriate connectors to an NHIN Gateway or their data may not be stored internally in the NHIN document format.
- The NHIN Connect software provides for a single gateway to be connected to a single local community. Northrop Grumman has studied this issue and understands the steps required to remove this restriction so that a single NHIN gateway can be connected to multiple local communities. This will remove the need for there to be a gateway for every provider organization.
- While not a technical issue, the legal framework for allowing the exchange of medical data between providers is not resolved for every locale or situation. The NHIN has developed a Data

Use and Reciprocal Support Agreement (DURSA) that has been sufficient to enable the tests now in production. (See Installed Locations).

Northrop Grumman is at the forefront of one technology that can bridge the gap between many EMR systems in the marketplace today and the document centric protocols, currently the backbone of clinical data exchange, using NHIN protocols. Working with the Department of Defense, Northrop Grumman helped produce a technique known as dynamic document assembly. As with many EMR systems the DoD's medical data is not stored in documents, rather it is stored in their custom database known as the Clinical Data Repository (CDR). This process works by assembling the standard C32 (Continuity of Care) document from data in the local EMR database upon request for a given patient's medical information. The document assembly process takes a few more seconds than the retrieval of data already in a standard document format, but the process opens up huge existing clinical data stores to exchange on the internet using NHIN standard protocols.

With additional effort the data contained in the dynamic document can be expanded to include any medical data supported by the C83 standard.

Suggested Service Level Agreement Terms

The Northrop Grumman technical staff will maintain the operational environment 24 hours a day, seven days a week, and 365 days a year. Typical SLA's for hosting of NGC Technical Operations Facilities maintain availability at levels greater than 98.5 percent, which will be measured monthly for the production environment. Primary monitoring of the production environment may be accomplished using products such as Hewlett Packard (HP) OpenView, EMC Control Center, and NetTracker Commercial-Off-The-Shelf (COTS) products. HP OpenView is configured to monitor processes on each of the critical components of the production environment and to automatically alert Operations staff from Northrop Grumman when an alarm is triggered. Alarms vary from notifications that a disk drive has surpassed a predefined threshold, to system outage alerts.

The Northrop Grumman team will provide service monitoring and control via real-time observation and alerting about health conditions in the SHARE environment. Northrop Grumman has a comprehensive set of procedures and tools that proactively monitor all systems that will make up the SHARE HIE solution. The operations staff will have the ability to proactively monitor the availability and performance of the entire system, to help minimize downtime, optimize application performance, and quickly identify potential problem areas.

Privacy and Security

The following issues arise when dealing with patient privacy and security with regards to electronic health records:

1) Computer configuration and management issues:
    a. Secure storage of the data
    b. Secure transmission of the data
2) Allowing only persons authorized by the patient to see their personal health information.

Item number one be effectively solved by applying best practices for data storage and transmission. The data repository must be protected from unauthorized access, while data in transmission must be encrypted to prevent snooping and modification of the data. Techniques for accomplishing these tasks are well understood.

Item number two is more difficult. In part it is a technical problem, but even more significantly it is a training problem. Where do patients go to specify who may see their health data. Today, they generally sign a paper form at each doctor's office allowing all the staff in the office access to their data. Where do they specify what data may be shared between doctors and hospitals? Generally there is no place where they can do this today. The right place for this to happen is by having them access a personal health record electronically, where such a system has implemented an interface for them to specify how their data may be shared. Today, there are few places where such decisions can be entered, and generally such interfaces do not provide a granular selection of permissions. The most typical early implementation of patient authorization is "opt-in" or "opt-out", which is an all or nothing decision with respect to the sharing of personal information.

The NHIN has built into it the use of XACML for expressing fine-grain choices with respect to data sharing. That means that fine grain access controls can be expressed in terms the computer can understand and compute. The areas were things become difficult is that there is no nationwide provider directory from which a patient can select care providers with whom they want to share information, so there are problems in specifying "share with" directives. The other area is in the specification of users making requests for information. The NHIN software has a place in the protocol where the user and the role the user plays in the healthcare system can be specified, however, few medical record systems know how to insert that information into the SAML record so that it can be transmitted as a part of the request. Further, few systems are ready to specify the "role" the user plays in the healthcare system so

that access controls can be based on a user's role. These items need to be rectified before a fully robust and granular access controls to personal health information can be implemented through electronic means.

Master Patient Index (MPI)

A master patient index with "probabilistic matching" is an important element in Health Information Exchange. A critical function in an HIE is the ability to uniquely and unambiguously match patient records based on demographic (trait data) given for a patient. Generally ,first name and last name are not sufficiently unique to match patient records. At a minimum, to achieve successful matching, the gender and date of birth must also be provided. Additional data can help this matching process such as home address (and previous home addresses), location of birth, phone numbers etc.

The most sophisticated MPI available today is that offered by Initiate Systems (recently acquired by International Business Machines (IBM)). As the most sophisticated it is also the most expensive. There are also other commercial vendors of MPI technology such as InFrame and InterComponentWare (ICW). NHIN-Connect in an effort to stay with low cost open source solutions which includes connectivity to Oracle's (formerly Sun Microsystems') Mural MPI solution.

Exchange of Payer Information

There are standards for the exchange of payment information for healthcare. Among these standards are "ASC X12N Health Care Claim (835(payment)/837(billing)) ". While some groups are exchanging such information today (mostly in a point to point manner), the generalized exchange of healthcare needs are an input from SYSTEMWARE. Since such exchange necessarily involves money. Facilitating such exchange on behalf of providers and insurance companies can generate income to a health information exchange by taking a fee for each transaction. The Utah Health Information Network (UHIN – www.uhin.org) began as an exchange for payment processing only. Perhaps they saw that this facility could easily generate revenues to sustain their exchange. They are now in the process of adding clinical information to their exchange.

While billing and payment are important parts of the relationship between a provider and a payer, it does not cover all the information of value that could be shared between them. It would be valuable to providers to be able to check on coverage for each patient before they arrive for service. Formulary information for providers can better help them prescribe

medication for their patients that fits within their prescription drug coverage. Studies have shown that when such information is available to providers, they generally chose prescriptions that are effective yet cost less to the consumer.

In order to provide such capability to the Arkansas HIE, Northrop Grumman would partner with an experienced vendor of healthcare medical banking technology such as SYSTEMWARE.

Health Information Exchange Funding Models

Northrop Grumman values its role and responsibility as an "honest broker" that would connect providers of value-add services to the consumers that require them, when they are ready to benefit.

The sustainability model can be based on several different means of revenue generation:

- **Membership Fee Model—**In this model, different entities pay for memberships or subscriptions. Fees could vary based on the number of members in the organization, anticipated level of use based on history data, or tiered based on the types of services the organization plans to use.
- **Transaction Fee Model—**In this approach, entities using the SHARE HIE would pay a fixed price by person covered or by type of data retrieval or service used. Fees could also be bracketed, so that heavier users of the exchange would receive discounting. Fees could also be assessed at the "ATM" level (where fees are assessed at each transaction), or in weekly or monthly blocks.
- **Program and Service Fee Model—**In this model, costs are assessed "downstream" to overall programs that benefit from use of the exchange. This simplifies the accounting greatly, but the return on investment must be clearly demonstrated to the stakeholder.
- **Incentives—**All approaches will likely need to emphasize incentives, particularly in the earlier stages. For example, patients may be offered an incentive by a payer organization not to "opt out" of population studies. The payer may then recover the costs (and better yet, derive revenue), from selling access to de-identified data for outcomes research or pharma-applications. Pay for performance incentives will motivate practitioners to become involved.
- **Hybrid Models**—The most realistic solution is a hybrid model, since the burden of investment, as well as the sharing of risk, should be shared across as many stakeholders as possible. The health market is a complicated web of connected and sometimes competing interests, and unbalanced solutions are not likely to survive very long.

The general approach to securing services and information from the SHARE HIE will be dynamically driven through the highly matrixed approach where competition always exists. The more flexible the options presented, the better empowered the consumer organization is to select the best value.

Bottom Line—SHARE will select which model best fits it stakeholders and the stakeholders should drive the ultimate business model adoption.

Health Information Exchange Pricing Model:

The goal of this section is to allow SHARE to gain an understanding of how a NGC pricing model may be implemented using a total cost of ownership approach.

We can provide pricing which addresses both fixed unit and variable cost throughout a total cost of ownership (TOC) model. Our estimated pricing would be based on a time and materials contract. This T&M contract enables SHARE to determine labor rates throughout the projected years of TCO and ensures that no additional work will be executed without proper scope modifications that are mutually agreed to by both parties. Monthly progress reporting will be provided to SHARE that compares estimated costs to actual thereby allowing both SHARE and Northrop Grumman to make scope adjustments if variances in requirements are projected.

Additionally, the below table outlines several of our cost centers which may be associated with the services of our sub-contractors:

Exhibit 7: HIE Pricing Model

Cost Center	Vendor	Proposal
HIE Implementation Fee	NGC	Pricing Requirements would be based on the number of baseline adapters and connections for SHARE initial start up
Hosting Fee	NGC or Arkansas	Pricing for Hosting would be dependent on Arkansas requirement
Training	NGC	Pricing for Support & Training is based on set up and maintenance requirements for HIE participants
Operations and Maintenance	NGC	Pricing would be T&M

Estimated Cost Assumptions

Our estimated costs will be based on the following assumptions:

a. Help desk support is 24/7 x 365 as required and contracted for by SHARE.
b. The HIE is an open source platform but there will be development hours associated to meet the specific requirements of applications adopted by SHARE and that normally requires a subscription service. Development hours for specific adapters will be billed at hourly rates.
c. All deliverables will be priced on a T&M basis.
d. We will provide monthly invoicing and payment will be expected net 30 days.
e. We will invoice for non-labor services upon provision:

1. Subscription services,
2. Infrastructure hosting services,
3. Web based training hosting, and
4. Hardware and software as called for in the RFP.

Customization work will be performed as change orders and defined using a statement of work. We will support re-prioritization of projected deliverables and schedules as requested and as possible given exchange dependencies.

Other Features or Options

Electronic Payment between Providers and Payers

Incorporating an electronic payment system between providers and payers not only offers a way to sustain a Health Information Exchange through transactions fees, but can provide other benefits as well to bring costs savings to healthcare. These additional benefits could include:

1) Transforming AFP/PDF payer print streams to compliant EDI 835 files for automatic posting into Practice Management Systems.
2) Reducing collections cost by allowing providers to view eligibility and benefits (270/271), as well as payer cost estimation during the point of care allowing for patient responsible collections prior to rather than after the lengthy provider/payer benefits process.
3) Education of the paper storage costs inherent in the status quo (i.e. offsite storage facilities, square footage costs associated with file cabinets, etc).
4) Reducing CSR research activities in the AR department of providers and the AP department of payers by allowing for meaningful access of historical data through a single source.
5) Improving visibility into the reconciliation of remittance advice (EOBs and/or 835s), to the funds actually received. Currently remittance advice and funds associated with these, proceed down two discrete paths making the act of true reconciliation a less than desirable process.
6) Additionally, payers who are currently not capable of EDI Remittance Advice (835), will be in a unique position to accelerate their time to EDI through the submission of AFP/PDF EOB files to the HIE transform service. These files are currently sent by payers for print and mail (EOB/EOP). By leveraging proven EOB to EDI transform services, payers will not only be on an accelerated path to EDI, but will also experience true cost

savings year over year through print suppression of the health data currently exchanged by mail.

Medical Data Translation

Northrop Grumman has significant experience in the area of supporting public health. We support the CDC directly with software implementations using personnel on-site in Atlanta Georgia. In our NHIN prototype we successfully filtered lab and radiology information to a set of interest to the Centers of Disease Control (CDC). Working with Arkansas Public Health officials we will provide them real-time on-line capabilities to track information of interest from the providers connected to the Arkansas HIE.

We can support the ability to translate medical terminologies from one code-set to another code-set using our Translation Service Bureau and Natural Language prototypes as a basis. However, such capabilities are not inexpensive. This is why such capabilities have not yet been widely deployed even though they rank high on the list of desired capabilities.

Personal Health Record (PHR)

A powerful concept in Heath Information Exchange is that of the Personal Health Record or PHR. The concept behind the PHR is that the patient themselves has access to their own health records on-line. There is evidence that for a significant group of people that the ability to access their own health records creates within them a stronger attitude toward personal responsibility for their own health. When tools are added to help them track their personal health statistics, they are more likely to make a conscious effort to work to improve their own health metrics.

There are numerous ways in which a fully featured Personal Health Record could benefit individuals. It can provide them with the following capabilities:

- To control who has access to their personal health information.
- To access a child's immunization record and have it forwarded to a public school for registration.
- To access the results of a physical exam as may be needed for employment or for participation in athletics and have it forwarded to the organization which requested it.
- To track personal health metrics such as
    - Weight
    - Blood pressure
    - Blood sugar levels
- To get questions answered from their doctor's office through e-mail exchange
- To have erroneous data in their health record corrected.
- To order prescription refills

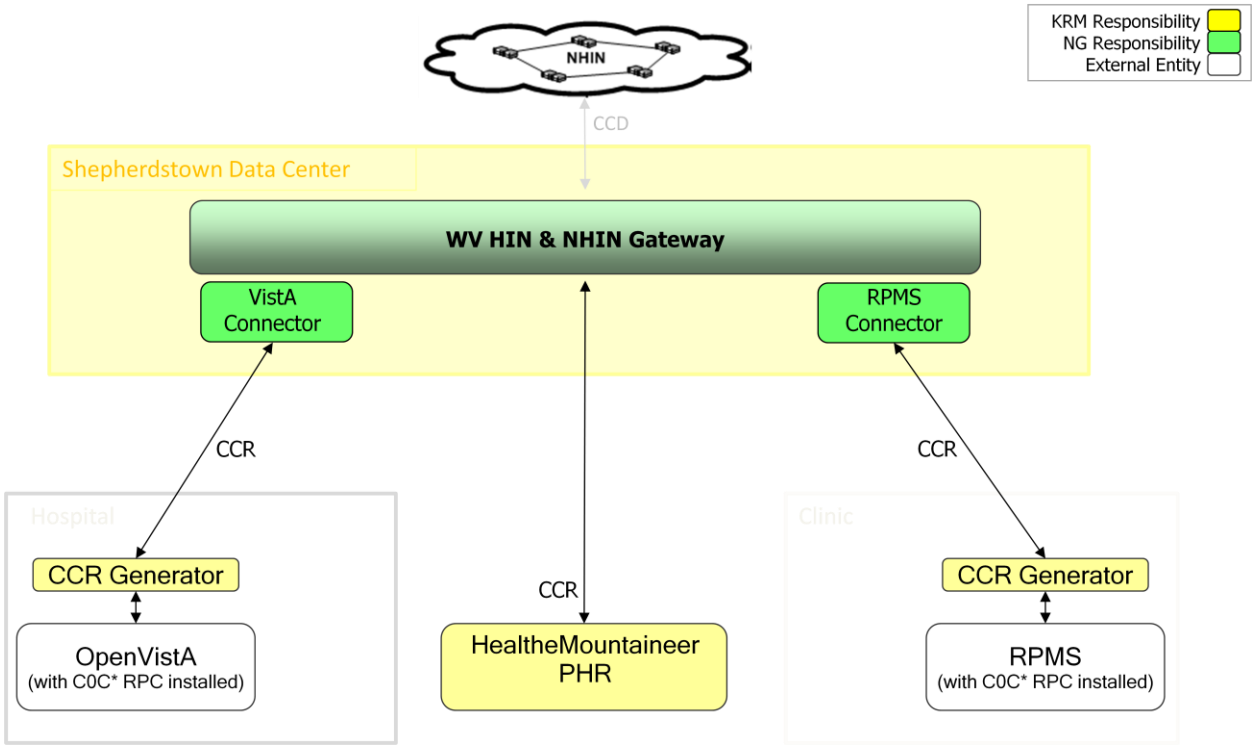
- To see laboratory results
- To schedule appointments on-line
- To make billing inquiries

Northrop Grumman considers patient consent a critical component in widespread adoption of health information exchange. Our first prototype of the Nationwide Health Information Network featured a consent management application built in to a PHR. The PHR application allowed patients to see all their data that was available across the network and specify which data elements could be shared and which providers were allowed to view it.

The availability of a PHR is also the best way to allow individuals to control their personal health. They would do this by accessing their personal health record and using a tool provided there to specify who they desire to have access to their health information. In the long range view of the NHIN these access controls should be "fine grained". For example they may want only doctors Smith and Jones to see their mental health information, but all other health information can be seen by any doctor. While the NHIN today has the ability to evaluate such "fine grained" access controls, there is no user friendly way for a patient to specify such restrictions.

A PHR system could be established using a NHIN-Gateway. Depending on loads the PHR could share an existing gateway or be split-off to use its own gateway. NHIN-Connect does not provide any features today to support a PHR. Other companies have developed custom PHRs. For example both Microsoft and Google operate PHRs today, but they do not use NHIN protocols. Their objective is to attract customers and derive internet advertizing revenue through the traffic that uses their sites. Third parties have developed some PHR capabilities, but again they have not yet focused on using NHIN protocols. In order to provide such capability to the Arkansas HIE, Northrop Grumman would look to partner with a vendor such as KRM.

Exhibit 8: Northrop Grumman / West Virginia HIE Pilot



Clinical Viewers

Northrop Grumman has developed web based displays of clinical information to meet the requirements of various projects and demonstrations including:

- NHIN Architectural prototype
- NHIN Trial Implementations
- West Virginia Personal Health Record Proof of Concept

Northrop is currently involved with the Military Interoperable Digital Hospital Test bed (MIDHT), a project funded by the DOD under the direction of the Conemaugh Health System. The project demonstrates how the NHIN provides a technology "gateway" and a legal framework for the secure exchange of health information between treating physicians, when authorized by a patient, ensuring around-the-clock access to critical health information while helping to avoid redundant care and testing. MIDHT is a five-year program managed by the Telemedicine and Advanced Technology Research Center (TATRC) to research and evaluate electronic health information services and technologies that make health information readily available to consumers, military health providers and private sector rural providers. The

Conemaugh and NGC team contributed to the development of the universal adapter currently in use in the national Virtual Lifetime Electronic Record (VLER) project (VLER 1a) in San Diego.

We have experience in creating viewers for clinical information that work well in the health care setting. Further the XML transformation for the viewing of Continuity of Care documents is tending toward a standard that may become common place industry-wide.

Conclusion

As described above, we believe Northrop Grumman's business, technical and architectural approach provides the solution for Arkansas to achieve its vision, and accomplish its mission (Exhibit 9). Northrop Grumman is ready and positioned to leverage our existing federal partnerships with the State of Arkansas, SHARE and provide private sector leadership to the accomplishment of these efforts.

The protection of an individual's health information is a cornerstone of the NG HIE Solution. The citizens of Arkansas will benefit from Northrop Grumman's strong authentication of identity and access process which will contribute to transparency by providing a patient with access to whom has accessed their personal information. We are champions for patient privacy and leaders of identity and privacy technologies in a world increasingly threatened by cyber espionage and crimes.

In Summary

- We offer a consumer-centric, open source, flexible, reliable, sustainable and secure solution for exchanging clinical data.
- Our solution is based on a reliable, secure, responsive, and scalable exchange.
- Our solution includes the ability to host SHARE in a secure data center that is operational today, reducing initial deployment and startup efforts.
- The Northrop Grumman Team's practical HIE experience minimizes your program management risk.
- Our organization and management approach provides a presence in Arkansas and uses proven monitoring and control processes, further minimizing program risk.

Exhibit 9: Arkansas HIE Vision and Mission Statements

Arkansas Health Information Exchange: Vision Statement

The Arkansas Health Information Exchange (HIE) will provide a mechanism through which individuals, health care providers and health organizations can share health-related information and thus strengthen the delivery of health care throughout Arkansas, leading to improved patient care, individual health decisions, public health outcomes and the cost-effective use of health care resources. The Arkansas HIE will achieve broad acceptance, credibility and access by employing advanced technologies that ensure efficiency, privacy and security, and will continuously evolve to serve Arkansans more effectively.

Arkansas Health Information Exchange: Mission Statement

The Arkansas Health Information Exchange (HIE) will advance secure connectivity and serve as a sustainable, interoperable data exchange platform for health-related information.